NPSafe

Safe Acts & Attitudes Foster Excellence

It's The Dose That Makes The Poison!

Understanding Exposure Assessment

Participant's Guide

Prepared by
NPS Risk Management Division

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How to Interact with the Instructor

We encourage you to ask questions and share your comments with the instructors throughout this TELNPS course.

If you were physically in the classroom with the instructor, you would raise your hand to let him know you had a question or comment. Then you would wait for the instructor to recognize you and ask for your question. We are all familiar with that "protocol" for asking questions or making comments.

With TELNPS courses there is also a "protocol" to follow to ensure you can easily ask questions and others can participate as well. It may seem a little strange at first asking a question of a TV monitor. Remember, it is the instructor you are interacting with and not the monitor. As you ask more questions and participate in more TELNPS courses, you will soon be focusing only on the content of your question and not the equipment you are using to ask it.

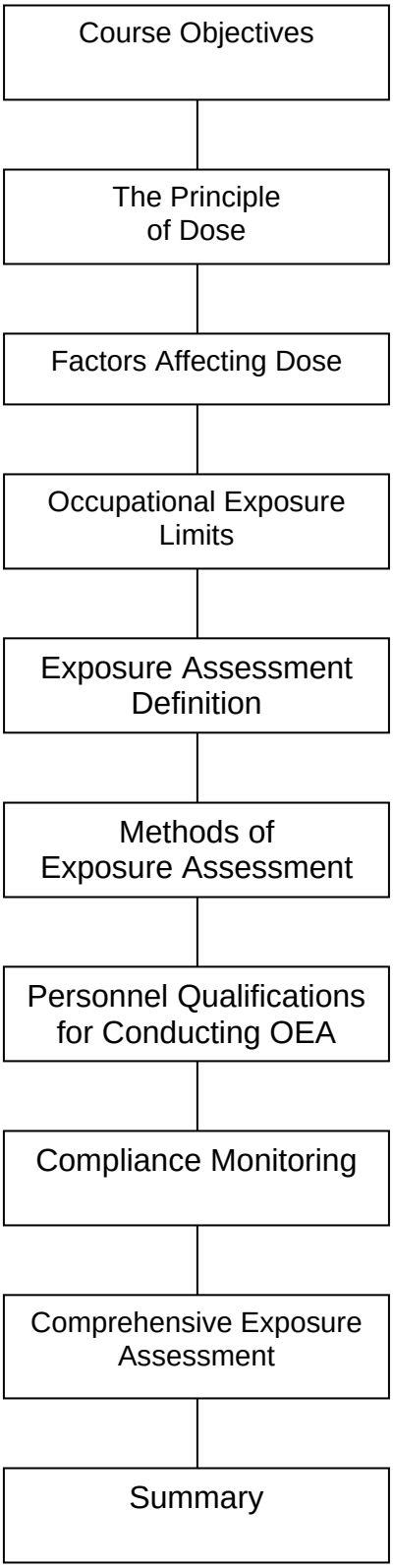
As part of the TEL station equipment at your location, there are several push to talk microphones. Depending on the number of students at your location, you may have one directly in front of you or you may be sharing one with other students at your table.

When you have a question, press the push to talk button and say,
"Excuse me [instructor's first name], this is [your first name]
at [your location]. I have a question (or I have a comment)."
Then release the push to talk button. This is important.
Until you release the button, you will not be able to hear the instructor.

The instructor will acknowledge you and then ask for your question or comment. Stating your name and location not only helps the instructor, but also helps other students who are participating at different locations to get to know their classmates.

PLEASE NOTE: When you speak into the microphone, keep a distance of 12 –15 inches for the best clarity. If you are closer than this, the audio quality is decreased significantly.

"It's the Dose That Makes the Poison"
Understanding Exposure Assessment – Course Map



Course Objectives

Notes

At the conclusion of this course, you should be able to -

1. Explain the principle of dose and its role in determining how safe or hazardous an occupational exposure is.
2. List factors that can affect the dose an employee receives.
3. Define Occupational Exposure Limit (OEL). Define six types of OELs, and describe their use.
4. Define Exposure assessment.
5. List four methods for assessing worker exposures. Describe their use and limitations.
6. List personnel that are qualified to conduct OEA.
7. List two basic strategies for assessing occupational exposure.
8. Describe compliance monitoring and list at least six regulated agents and at least four regulated activities NPS workers are exposed to or participate in, for which there are specific exposure monitoring requirements.
9. Briefly describe a comprehensive Exposure Monitoring Strategy and its implementation. Describe the steps for conducting Comprehensive Exposure Assessments.

The Principle of Dose

List five tasks that employees do that involve chemical, physical or biological agents. Of the five tasks that you listed, determine which you would consider hazardous to the employee's health.

Task	Agent	Hazardous?
1.		Yes / No
2.		Yes / No
3.		Yes / No
4.		Yes / No
5.		Yes / No

Briefly describe how you made the determination whether or not the task was hazardous.

"It's the dose that makes the poison."
- Paracelsus (1493-1541)

The Principle of Dose (continued)

Notes

Remember –

1. Not all ugly sounding or looking chemical formulas immediately constitute a _____ risk.

2. Whether or not there is a _____ effect depends on the quantity of the hazardous chemicals taken into the body.

3. In some cases, the compounds may be reported to actually provide a beneficial effect to the body in small doses.

Questions to Consider

1. How much of the substance is being vaporized?

2. Can the solvent penetrate the skin and move to the blood or target organs?

3. Is there a strong odor produced?

4. Should employees wear a respirator?

5. Should we install a ventilation system?

Factors Affecting Dose

Notes

Several factors can affect the dose an employee receives or the extent to which the dose becomes _____ to the employee's health –

These factors include:

1. _____ in the environment.

2. _____ of exposure.

3. _____ conditions.

4. The _____ reaction.

At Your Site…

For two of the tasks that you listed at the top of page 4, complete the following:

Task:	
Chemical, Physical or Biological Agent:	
Concentration in the Environment:	Low | Med | High
Duration of Exposure:	_____ hours
Environmental Conditions:	
Affect on the Body:	Low Toxicity | Med Toxicity | High Toxicity

Task:	
Chemical, Physical or Biological Agent:	
Concentration in the Environment:	Low | Med | High
Duration of Exposure:	_____ hours
Environmental Conditions:	
Affect on the Body:	Low Toxicity | Med Toxicity | High Toxicity

Occupational Exposure Limits (OEL's)

Notes

Occupational Exposure Limit or OEL is an allowable concentration or intensity of a hazardous agent in the employee's immediate work environment over a given period of time. OELs are generally expressed as 8-hour time weighted averages (TWA) or as excursion or short term exposure limits of 15 or 30 minute duration. The OELs used by NPS are the OSHA Permissible Exposure Limit (PEL) and the Threshold Limit Values published by ACGIH.

Time Weighted Average or TWA refers to a concentration that has been weighted for the time duration of the sample.

Permissible Exposure Limit or PEL is the limit that is set by OSHA and published as codified federal regulation.

Threshold Limit Values or TLV are consensus standards, reviewed and updated continuously, published by American Conference of Governmental Industrial Hygienists (ACGIH).

Recommended Exposue Limit or REL is the limit set by NIOSH

Short Term Exposure Limit or STEL The maximum concentration for continuous 15 minute periods. Allowed 4 times per day with at least 60 minutes between exposures.

Ceiling Limit is the absolute limit of exposure at any time and durations. (ACGIH).

Immediately Dangerous to Life and Health or IDLH is Any atmosphere that poses an immediate hazard to life or poses immediate irreversal debilitating effects on health.

Action Level or AL is the level of exposure, described as the concentration over a given period of time, at which exposure control measures must be implemented to reduced the potential for an unacceptable worker exposure. Action levels are prescribed by OSHA regulation for certain agents. In the absence of OSHA-prescribed ALs, NPS will use 50% of the TLV (or PEL if no TLV is available) as the AL.

2004 ACGIH Threshold Limit Values and Biological Exposure Indices Booklet

To receive a copy, send an email request to: **david_p_bleicher@partner.nps.gov**

Make the subject line – "ACGIH TLV Booklet Request". Be sure to include your name, park name, and complete mailing address in the text of the email.

Definition of Exposure Assessment

Notes

Employee Exposure is an exposure to chemical, physical, or biological agents that occurs in the workplace regardless of the use of personal protective equipment. (this is essentially the potential for exposure; how concentrated or intense is the hazard in the work environment. This gives us an indication of whether or not controls are need to reduce or eliminate the risk to the employee that must otherwise work in the environment.)

Exposure Assessment is the qualitative or quantitative determination made by and industrial hygienist or other appropriately trained individual, of an employee's exposure to a chemical biological or physical agent. (The distinction from exposure monitoring is that we have several methods of assessing worker exposure or risk of an unacceptable dose, one of which is direct measurement—exposure monitoring).

Methods of Exposure Assessment

Notes

1. **Area Monitoring**.
This includes things such as using colorimetric detector tubes to collect discrete samples or grab samples. May be accomplished with direct reading instruments. This information can be used to estimate workshift or task exposures. Another example is estimating noise dose using area noise data. Or, calculating a worst case TWA exposure to a chemical .

2. **Modeling**.
Calculation can be used to characterized/estimate exposures. examples are the box model with input for generation and removal rates. A hybrid between 1 and 2 may be the use of instruments such as the WBGT meter that measures environmental information that is used to calculate a heat stress index, used to estimate the heat stress a worker could be experiencing. (actually, heat stress provides a great example of progressive screening from rough indexes to more refined indexes to physiological monitoring.

3. **Objective Data.**
This can be "old" monitoring data (<12 months old), or may come from the literature or manufacturer's information.

4. **Personal Monitoring**.
May be active or passive. Active samples us pumps, passive rely on diffusion. May require lab analysis or may be direct reading. We should reserve this method for compliance requirements, special cases, and for uncertain exposures.

Exposure Assessment Personnel

Industrial Hygienist is a civil service General Schedule 690 Series employee or equivalent in the private sector.

Experienced Industrial Hygienist is a civil service General Schedule 690 Series employee GS-12 and above (or PHS O-4 or above) or any Certified Industrial Hygienist (CIH).

Workplace Monitor is an individual trained in exposure monitoring working under the direction of an industrial hygienist.

Compliance Monitoring

Notes

With Compliance Monitoring, we focus on the _____ risk employee to determine whether exposures are above or below established limits.

For several agents, _____ has mandated that exposure assessment be conducted in certain ways.

Compliance Monitoring (continued)

Table 1
OSHA Mandated Agent and Program-Specific Monitoring Requirements of note for NPS

Agent	Reference	Exposure Assessment Requirements
Lead	29 CFR 1926.62 29 CFR 1910.1025	Work shift & short term monitoring of representative employees and tasks; Initial, quarterly, semi annually, or annually; Objective data permitted.
Asbestos	29 CFR 1910.1001 29 CFR 1926.1101	Initial exposure assessment prior to initiating work; Work shift & excursion monitoring; daily & periodic depending on work classification; objective data permitted.
Inorganic Arsenic	29 CFR 1910.1018	Work shift monitoring; quarterly or annually depending on concentration.
Benzene	29 CFR 1910.1028 46 CFR 197.540	Work shift and short term monitoring each job class and work area; Initial, semi annual and annual (time of year may be prescribed).
Cadmium	29 CFR 1910.1027 29 CFR 1926.1127	Work shift monitoring of representative employees and tasks; initial and semi annually.
13 Carcinogens	29 CFR 1910.1003	
Acrylonitrile	29 CFR 1910.1045	Work shift monitoring; Initial and monthly or quarterly depending on concentration.
Ethlene oxide	29 CFR 1910.1047	Work shift & short term monitoring each job class and work area; initial, quarterly semi annually.
Formaldehyde	29 CFR 1910.1048	Work shift & short term monitoring of representative employees and tasks; Initial, semi annual and annual; objective data permitted for negative determination.
Butadiene	29 CFR 1910.1051	Work shift & short term monitoring of representative employees and tasks; Initial, quarterly, semi annual or annual; object data permitted
Noise	29 CFR 1910.95	Area & personal monitoring to determine employee exposure.
Respiratory Protection	29 CFR 1910.134	Exposure assessment that includes a reasonable estimate of employee exposure
HAZWOPRER	29 CFR 1910.120	Requires design of an exposure assessment program as part of the Site-Specific Safety and Health Plan
Laboratories	29 CFR 1910.1450	Requires a *Chemical Hygiene Plan* and an exposure assessment
Dip Tanks	1910.126	Requires evaluation of probable skin contact and effectiveness of airborne contaminant control measures.
Abrasive Blasting	29 CFR 1910.94	Evaluation of dust hazards from abrasive blasting.
Ionizing Radiation	29 CFR 1910.1096	Exposure assessment required.

To Receive Course Credit

Notes

1. PRINT your name on the attendance roster.
2. Complete the course final project at www.GovLearning.net/NPS
3. Complete the course evaluation at MyLearningManager

Exposure Assessment Final Project

Goal: Understand worker exposure potential by evaluating the workplace, tasks, procedures, hazardous agents, and existing control measures as factors contributing to employee exposure.

Assignment:

1. Choose a shop or process in your Division or Park which you will characterize and for which you will gather information to support your employee's exposure assessment. Include all chemical and physical (radiation, noise, etc) agents associated with the process.
2. For each Job-Process-Agent, describe your recommendation for resolving assessment uncertainties.

Examples:

Job Title	Processes/Activities/Tasks	# Employees Similarly Exposed	Agents	Existing Controls	Current Exposure Classification	Existing Basis for Judging Exposure
Painting Shop: Painter	Uses chemical stripper to remove old paint	4	Methylene chloride	none	Uncertain	None
			Caustic alkali (dermal)	Butyl rubber gloves	Acceptable	None
			Lead	½ face respirator w N100 filter	unacceptable	Personal Exposure Monitoring
Recommendation for resolving assessment uncertainties						

Job Title	Processes/Activities/Tasks	# Employees Similarly Exposed	Agents	Existing Controls	Current Exposure Classification	Existing Basis for Judging Exposure
Painting Shop: Painter	Applies primer and top coating with epoxy primer and paint	2	Epoxy resins	None	acceptable	Modeling, Objective data
			Aromatic Amine Curing Agents	None	Uncertain	Qualitative Objective Data
			Reactive Diluent	None	Uncertain	None
Recommendation for resolving assessment uncertainties						